

Photonic Oscillators and Links for Deep Space and Near Earth Applications

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This paper will present details of the current work ,and future plans, related to photonic reference generation and RF links at JPL in support of the Deep Space Network and NASA missions. Requirements of phase coherence for the Deep Space communications and radio science experiments relying on the earth-spacecraft communications links are extremely demanding, and in many instances cannot be met without photonic links. Similarly, distribution of radar signals related to some Space Shuttle experiments can only be accomplished using photonic systems. In this paper a review of the requirements is first made, and the current work in rf-photonic links at JPL is discussed. In particular, we will discuss the Opto-Electronic Oscillator, currently under development, which represents a major capability for spacecraft Ka-band communications system, and for radio science experiments. I will also discuss the performance of a ground based photonic link for reference distribution, and a demonstration of an RF link for a Space Shuttle experiment. Issues related to the radiation environment of space will be considered. Finally, a discussion of future plans to enhance current capabilities is also made.